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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/748,546	12/30/2003	Alex Nugent	1000-1215	9090

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Ortiz & Lopez, PLLC
Patent Attorneys
P.O. Box 4484
Albuquerque, NM 87196-4484

EXAMINER	
CALDWELL, MICHAEL J	
ART UNIT	**PAPER NUMBER**
2129	

DATE MAILED: 04/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/748,546	NUGENT, ALEX	
	Examiner	Art Unit	
	Michael Caldwell	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1-29-04, 8-30-04*, 10-6-05, 2-2-06

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

1. This office action is responsive to application 10/748,546 filed Dec. 30th, 2003 which claims priority from previous continuation-in-part applications to an earlier Aug. 22nd, 2002 date. Claims 1-20 have been examined.

Claim Objections

2. Claim 10 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The disclosed molecular connections are inherently required to comprise molecules as is everything else that is physical.

3. Claim 19 is objected to because of the following informalities: Claim 19 depends on itself and is thus in improper dependent claim form (see 37. C.F.R. §1.67). It is believe that this claim was intended to depend from claim 18, and has been treated as such for the remainder of this office action, however appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 11 recites the limitation "molecular nanoconnections" in line 3. There is insufficient antecedent basis for this limitation in the claim. The only type of connections in this claim's depending claim tree have only been described simply as "molecular."

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Widrow et al. (U.S. Patent 3, 222, 654, herein referred to as Widrow). Examiner suggests applicant review the entire teaching of Widrow, as its entire teachings have been relied upon. When referring to a column and line number of the reference, the following nomenclature is used: CX, LY-Z representing column X, lines Y-Z.

Regarding claim 1

1. A system, comprising: a physical neural network (C 1-12, particularly C 1, L 10-14, and L 40-48, where it describes "`an adaptive or learning logic network automatically modifies its own structure,`" where its physical properties are discussed in later paragraphs and earlier figures) comprising a liquid state machine (C 1-12, particularly C 4, L34-55, where it discusses the electrode and liquid electrolyte that changes state to reflect changes in information, via resistivity), wherein said physical neural network comprises molecular connections located within a dielectric

solvent between pre-synaptic and post-synaptic electrodes thereof (C 1-12, particularly C 4, L 35 through L 65, where it discusses leads **21** and **22** as pre- and post- synaptic electrodes thereof), such that said molecular connections are strengthened or weakened according to an application of an electric field, a frequency or a combination thereof to provide physical neural network connections thereof (C 1-12, particularly C 4, L 24-57; also C 4, L 49-55, where a frequency is inherent in an alternating current).

Regarding claim 2

2. The system of claim 1 wherein said liquid state machine comprises a dynamic fading memory mechanism (C 1-12, particularly C 4, L 59-73, the process of hysteresis exhibits a fading memory mechanism in which memory is lost through repeated application of the electric field given the particular electrolytic solution described within. Also in C 7, L 50-59 wherein the stability mentioned here comments on the memory's predisposition to fade).

Regarding claim 3

3. The system of claim 1 further comprising a supervised learning mechanism associated with said liquid state machine (C 1-12, particularly C 1, L 34-65 where it discusses the details and reasoning behind the supervised learning method of neural networks), whereby connections strengths of said molecular connections are determined by pre-synaptic and post-synaptic activity respectively associated with said pre-synaptic and post-synaptic electrodes (C 1-12, particularly C 2, L 13-24, also C 3, L 3-18; also C 4, L 34-55 where it discusses leads **21** and **22** as pre- and post- synaptic electrodes thereof).

Regarding claim 4

4. The system of claim 3 wherein said supervised learning mechanism comprises at least one perceptron (C 1-12, particularly C 2, L 40-43 as well as C 3, L 18-47 where it discusses the details of the functions of a perceptron, which is in its simplest embodiment a weighted summer followed by a non-linear output or thresholder).

Regarding claim 5

5. The system of claim 3 wherein said supervised learning mechanism learns via feedback obtained from said post-synaptic electrodes. (C 1-12, particularly C 1, L 45-55 where it refers to the adaptive logic network's prior experience, and the only way for such a system to be aware of its 'prior experience is through the use of feedback obtained from the post synaptic electrode; also see C 4, L 3-19 where the operation of the training mechanism is further discussed, also disclosing that the learning is purely mechanical and thus to reduce the errors to zero, the system must be aware of the actual and desired outputs, thus necessitating feedback)

Regarding claim 6

6. The system of claim 3 wherein said supervised learning mechanism comprises a linear read out mechanism (C 1-12, particularly C 3, L 17-57, where it discusses the quantizer-thresholding unit, and it's ability to produce a read out mechanism following the linear combinatory summer).

Regarding claim 7

7. The system of claim 3 wherein said supervised learning mechanism evolves based on an activity depending learning rule (C 1-12, particularly C 1, L 36-55).

Regarding claim 8

8. The system of claim 3 wherein said supervised learning mechanism evolves based on pre-synaptic and post-synaptic activity, including a voltage, frequency, or a combination thereof (C 1-12, particularly C 1, L 45 through C 2, L 2 where it discusses the supervised learning mechanism and in C 4, L 24-73 where it discusses the physical properties and mechanisms of the novel adaptive memory element; also C 4, L 49-55, where a frequency is inherent in an alternating current and where it discusses leads **21** and **22** as pre- and post- synaptic electrodes thereof).

Regarding claim 9

9. The system of claim 1 wherein said molecular connections comprise nanoparticles (C 1-12, particularly C 4, L 24-73, where it discusses the materials used to achieve electroplating. The reaction occurring at the molecular scale of this system contains particles that are in the order of $10^{\wedge -9}$).

Regarding claim 10

10. The system of claim 1 wherein said molecular connections comprise molecules (C 1-12, particularly C 4, L 24-73 where it discusses the materials used to achieve electroplating, however it remains inherently apparent that molecular connections comprise molecules).

Regarding claim 11

11. The system of claim 1 further comprising a connection network also comprising a plurality of said molecular connections (it remains inherent for a neural network to comprise a connection network as one can not exist without its respective connections),

wherein molecular nanoconnection thereof can be strengthened or weakened according to an application of said electric field or said frequency (C 1-12, particularly C 4, L 24-73 where it discusses the physical properties and mechanisms of the novel adaptive memory element; also C 4, L 49-55, where a frequency is inherent in an alternating current. Strengthening and weakening corresponds to the amount of deposit on the substrate, as more or less will strengthen or weaken the nanoconnections thereof).

Regarding claim 12

12. A system, comprising: a physical neural network (C 1-12, particularly C 1, L 10-14, and L 40-48, where it describes "`an adaptive or learning logic network automatically modifies its own structure`," where its physical properties are discussed in later paragraphs and earlier figures) comprising:

a liquid state machine (C 1-12, particularly C 4, L34-55, where it discusses the electrode and liquid electrolyte that changes state to reflect changes in information, via resistivity), wherein said physical neural network comprises molecular connections located within a dielectric solvent between pre-synaptic and post-synaptic electrodes thereof (C 1-12, particularly C 4, L 35 through L 65 where it discusses leads **21** and **22** as pre- and post- synaptic electrodes thereof), such that said molecular connections are strengthened or weakened according to an application of an electric field, a frequency or a combination thereof to provide physical neural network connections thereof (C 1-12, particularly C 4, L 24-57; also C 4, L 49-55, where a frequency is inherent in an alternating current); and

a supervised learning mechanism associated with said liquid state machine (C 1-12, particularly C 1, L 34-65 where it discusses the details and reasoning behind the supervised learning method of neural networks), whereby connections strengths of said molecular connections are determined by pre-synaptic and post-synaptic activity respectively associated with said pre-synaptic and post-synaptic electrodes (C 1-12, particularly C 2, L 13-24, also C 3, L 3-18; also C 4, L 34-55 where it discusses leads **21** and **22** as pre- and post- synaptic electrodes thereof)., wherein said liquid state machine comprises a dynamic fading memory mechanism (C 1-12, particularly C 4, L 59-73, the process of hysteresis exhibits a fading memory mechanism in which memory is lost through repeated application of the electric field given the particular electrolytic solution described within. Also in C 7, L 50-59 wherein the stability mentioned here comments on the memory's predisposition to fade).

Regarding claim 13

13. The system of claim 12 wherein said supervised learning mechanism comprises at least one perceptron (C 1-12, particularly C 2, L 40-43 as well as C 3, L 18-47 where it discusses the details of the functions of a perceptron, which is in its simplest embodiment a weighted summer followed by a non-linear output or thresholder).

Regarding claim 14

14. The system of claim 12 wherein said supervised learning mechanism learns via feedback obtained from said pre-synaptic and post-synaptic electrodes. (C 1-12, particularly C 1, L 45-55 where it refers to the adaptive logic network's prior experience, and the only way for such a system to be aware of its 'prior experience is through the

use of feedback obtained from the post synaptic electrode; also see C 4, L 3-19 where the operation of the training mechanism is further discussed, also disclosing that the learning is purely mechanical and thus to reduce the errors to zero, the system must be aware of the actual and desired outputs, thus necessitating feedback)

Regarding claim 15

15. The system of claim 12 wherein said supervised learning mechanism comprises a linear read out mechanism (C 1-12, particularly C 3, L 17-57 where it discusses the quantizer-thresholding unit, and it's ability to produce a read out mechanism following the linear combinatory summer).

Regarding claim 16

16. The system of claim 15 wherein said supervised learning mechanism evolves based on post-synaptic activity, including a voltage, frequency, or a combination thereof (C 1-12, particularly C 1, L 45 through C 2, L 2 where it discusses the supervised learning mechanism and in C 4, L 24-73 where it discusses the physical properties and mechanisms of the novel adaptive memory element; also C 4, L 49-55, where a frequency is inherent in an alternating current).

Regarding claim 17

17. The system of claim 12 wherein said molecular connections comprise nanoconnections (C 1-12, particularly C 4, L 24-73, where it discusses the materials used to achieve electroplating. The reaction occurring at the molecular scale of this system contains particles that are in the order of $10^{\wedge -9}$ that bond in accordance with the occurring chemical reaction).

Regarding claim 18

18. A system, comprising: a physical neural network (C 1-12, particularly C 1, L 10-14, and L 40-48, where it describes "an adaptive or learning logic network automatically modifies its own structure," where its physical properties are discussed in later paragraphs and earlier figures) comprising a liquid state machine (C 1-12, particularly C 4, L34-55, where it discusses the electrode and liquid electrolyte that changes state to reflect changes in information, via resistivity), wherein said physical neural network is formed utilizing nanotechnology (C 1-12, particularly C 1, L 29 through C 2, L 27 where it discusses adaptive memory elements of the type therein described and their role in logic networks becoming increasingly complex in size, thus requiring numerous amounts of memory elements. The nanotechnology is utilized in the form of chemical reactions at the substrate and electrode), including nanoconnections (C 1-12, particularly C 4, L 24-73, where it discusses the materials used to achieve electroplating. The reaction occurring at the molecular scale of this system contains particles that are in the order of $10^{\wedge-9}$ that bond in accordance with the occurring chemical reaction) located within a dielectric solvent between pre-synaptic and post-synaptic electrodes thereof (C 1-12, particularly C 4, L 35 through L 65), such that said nanoconnections are strengthened or weakened according to an application of an electric field, a frequency or a combination thereof (C 1-12, particularly C 4, L 24-57; also C 4, L 49-55, where a frequency is inherent in an alternating current) to provide a physical neural network thereof; and a supervised learning mechanism associated with said liquid state machine (C 1-12, particularly C 1, L 34-65 where it discusses the

details and reasoning behind the supervised learning method of neural networks), whereby connections strengths of said nanoconnections are determined by pre-synaptic and post-synaptic activity respectively associated with said pre-synaptic and post-synaptic electrodes (C 1-12, particularly C 2, L 13-24, also C 3, L 3-18), wherein said liquid state machine comprises a dynamic fading memory mechanism (C 1-12, particularly C 4, L 59-73, the process of hysteresis exhibits a fading memory mechanism in which memory is lost through repeated application of the electric field given the particular electrolytic solution described within. Also in C 7, L 50-59 wherein the stability mentioned here comments on the memory's predisposition to fade).

Regarding claim 19

19. The system of claim 19 (see above objections for correction requirements regarding this dependency; this claim has been treated to be dependent from claim 18 for purposes of this office action) wherein said physical neural network further comprises at least one connection network associated with at least one neuron-like node (it remains inherent for a neural network to comprise a connection network as one can not exist without its respective connections), wherein said at least one connection network comprises a plurality of said nanoconnections, including a plurality of interconnected nanoconductors (C 1-12, particularly C 4, L 24-73, where it discusses the materials used to achieve electroplating. The reaction occurring at the molecular scale of this system contains particles that are in the order of $10^{\wedge-9}$ that bond in accordance with the occurring chemical reaction. It is the nanoconductors within the aforementioned nanoconnections providing the channel for electron movement and thus conducting

electricity, specifically, the nanoconductors are the particles producing the conductivity, see C4, L 59-73), wherein each nanoconductor of said plurality of interconnected nanoconductors is strengthened or weakened according to an application of an electric field or frequency thereof (C 1-12, particularly C 4, L 24-73 where it discusses the physical properties and mechanisms of the novel adaptive memory element; also C 4, L 49-55, where a frequency is inherent in an alternating current. Strengthening and weakening corresponds to the amount of deposit on the substrate, as more or less will strengthen or weaken the nanoconnections thereof).

Regarding claim 20

20. The system of claim 19 wherein:

each nanoconductor of said plurality of interconnected nanoconductors experiences an increase in alignment in accordance with an increase or a decrease in said electric field, said frequency, or said combination thereof (inherently when an electric field is applied to any dipolar particle, such as the nanoconnections described above, it will become aligned accordingly under the physical properties of electricity; also C 4, L 49-55, where a frequency is inherent in an alternating current);

wherein nanoconductors of said plurality of interconnected nanoconductors that are utilized most frequently by said at least one neuron-like node become stronger with each use thereof (C 1-12, particularly C 4, L 24-73 where it discusses the physical properties and mechanisms of the novel adaptive memory element; also C 4, L 49-55, where a frequency is inherent in an alternating current. Strengthening corresponds to

an increase in the amount of deposit on the substrate, assuming using the proper electrolyte described herein – that is, adding the phenol sylphonic acid and Dacolite);

and wherein nanoconductors of said plurality of interconnected nanoconductors that are utilized least frequently become increasingly weak and eventually become unaligned (C 1-12, particularly C 4, L 24-73 where it discusses the physical properties and mechanisms of the novel adaptive memory element; also C 4, L 49-55, where a frequency is inherent in an alternating current. Less deposit on the substrate will weaken the nanoconnections thereof, increasing resistivity and reducing conductance, thus eventually causing the nanoconductors to become unaligned, corresponding to the dynamic fading memory mechanism)

Conclusion / Correspondence Information

6. Claims 1-20 have been rejected.

7. The following references have been referred to but not cited. It is suggested applicant review the teachings of these references to gain an understanding of the state of the art at the time of applicant's invention.

a. US Patent 5,315,162 – McHardy et al. – "Electrochemical synapses for artificial neural networks"

b. US Patent 5,293,455 – Castelaz -- "Spatial-temporal-structure processor for multi-sensor, multi scan data fusion"

c. Graf et al. – "Advances In Neural Network Hardware" – Electron Devices Meeting, 1988. Technical Digest., International 11-14 Dec. 1988 Pages: 766 - 769

d. Gerousis et al. -- "Modeling Nanoelectronic CNN Cells: CMOS, SETS and QCAs" -- IEEE International Symposium on Circuits and Systems, May 28-31, 2000

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Caldwell whose telephone number is (571) 272-1942. The examiner can normally be reached on Mon-Fri 10:00-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Vincent can be reached on (571) 272-3080. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MJC
4/11/2006

Wilbert L. Starks, Jr.
Primary Examiner
Art Unit - 2121